

Global Water and Energy Budget Studies

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Summary

A major goal of the Global Energy and Water Cycle Experiment (GEWEX) Continental-Scale Experiments (CSEs) has been to qualitatively and quantitatively describe (“close”) global and regional atmospheric and land water and energy cycles. Since few regional or global hydroclimatological observations were available when these water and energy budget studies (WEBS) first began, initial studies mainly included global and regional atmospheric reanalyses and macroscale hydrologic model simulations. Although reanalysis systems and hydrologic model simulations are certainly model dependent, at least they have many more observational constraints than, say, general circulation models forced by just sea surface temperatures. However, the errors are still large. In fact, individual process errors in these models, which tend to cancel, are much larger than the overall budget errors. Preliminary NCEP reanalysis comparisons show analysis precipitation errors are likely balanced in part by evaporation errors, although errors in other processes such as runoff and moisture convergence are almost as large, especially for certain regions, such as the Amazon and GAME tropics.

A number of additional GEWEX data sets, which have recently become available, can now be used to augment previous global regional water and energy budget studies and further assess the error in closing the water and energy cycles. GEWEX data sets include: the Global Precipitation Climatology Project (GPCP) precipitation, the International Satellite Climate Comparison Project (ISCCP) radiation as well as the Surface Radiation Project (SRB) surface radiation available through the International Satellite Land Surface Comparison Project (ISLSCP), the Global Runoff Data Center (GRDC) runoff, and the NASA water Vapor Project (NVAP) precipitable water as well as the precipitable water available through ISCCP . These data sets as well as the available global reanalyses (NCEP/NCAR, NCEP/DOE, ERA40) will be examined to see how well we can simulate, and “close” the water and energy budgets on climatological to monthly time scales and global to regional space scales. “Closure” depends upon understanding the uncertainty attached to the value of each hydroclimatological process.

Project Hypothesis:

The available GEWEX datasets, atmospheric reanalyses, and global land data assimilation data sets provide a quantitatively complete picture of the global water and energy cycle.

Relevance to NEWS challenge:

This work will lead to improved understanding and simulation of the global water and energy cycles.

NASA ESE System Components:

NASA gridded satellite data and data from ISCCP, GPCP, CMAP, NVAP, ISLSCP. SRB